An assessment of the basic medication safety practices in Khartoum State hospitals

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ABSTRACT

Purpose To assess the presence of medication safety practices in Khartoum State hospitals.

Methods A previously used questionnaire was used to evaluate medication safety practices. The main practices evaluated were the presence of a medication safety committee and error-reporting system, look-alike sound-alike (LASA) medications list, control of concentrated electrolyte solutions, care transitions, information technology, drug information and other medication safety practices. The primary investigator visited a stratified sample from all the three cities that comprise Khartoum State and interviewed the pharmacy supervisor of each hospital. Descriptive statistics were performed using SPSS V.22.

Results A total of 41 senior pharmacists or pharmacy supervisors from 41 hospitals were interviewed. Only 2% of the hospitals had a list of LASA medications and 5% had a list of error-prone abbreviations. Only 5% of the hospitals had a medication safety committee, and none of the hospitals had a medication safety officer. None of the hospitals involved pharmacists in obtaining medication histories. Concentrated electrolytes were available in the floor stock in 67% of the hospitals. Although 24% of the hospitals used a computer system in their pharmacy to enter prescriptions, none of these hospitals required entry of patient allergies before entering a drug order.

Conclusions Most of the hospitals in Khartoum State did not implement basic medication safety practices. Therefore, the Ministry of Health in Sudan should enforce laws and regulations making implementation of medication safety practices mandatory to ensure patient safety.

INTRODUCTION

Healthcare organisations have become increasingly concerned about the need to improve the quality of care provided to healthcare service users. These include the safety, effectiveness, appropriateness, access, efficiency and acceptability of the care. In recent years, patient safety has become a top priority for healthcare systems.¹ The WHO has defined patient safety as 'the reduction of the risk of unnecessary harm associated with healthcare to an acceptable minimum'.² In 1999, a landmark report, *To err is human: building a safer health system*, was released by the Institute of Medicine, bringing patient safety to the forefront of the world's attention.³ The major focus of the report was drug-related problems, encompassing adverse drug reactions, adverse drug events and medication errors.

Medication errors are the major cause of drug-related problems⁴ and result in harm to at least 1.5 million residents in the USA annually. The cost required to treat the injuries resulting from medication errors in the USA has been estimated to be 3.5 billion US dollars.⁵ Medication errors are also common in developing countries, including Sudan.^{6–8} Adverse drug events are widespread in both developed and developing countries.^{9–15}

To date, there is a lack of studies that describe or evaluate the current situation of medication safety practices in hospitals in Sudan. Establishing accurate medication safety practices will require an understanding of the current status and may help to guide policy makers and healthcare professionals on areas for improvement. Within this context, we aim in this study to assess the presence of basic medication safety practices in different Khartoum State hospitals.

METHODS

Study design

This was a descriptive cross-sectional survey carried out from February to April 2014.

Study setting

Sudan is geographically the third largest country in Africa with a total area of 728 215 square miles and a total population of ~31 million. Khartoum State, which includes the capital city Khartoum, has a total population of ~5 million.¹⁶ It is geographically divided into three blocks (or regions). The first block is called Khartoum, the second block is Bahri, and the third block is Omdurman. Health services in Sudan are provided by both public and private sectors.

In Khartoum State, hospitals are either government owned or private. Government hospitals can be classified as either Ministry of Health (MOH) or non-MOH. MOH runs 50 hospitals in all regions of Khartoum State. Other government hospitals include national security hospitals, armed forces hospitals, police hospitals and university hospitals. A convenient sample of hospitals was selected from each region in the three categories: MOH hospitals, non-MOH government hospitals, and private hospitals.

Study tool

A survey to assess the presence of basic medication safety practices in hospitals was adopted from one developed elsewhere.¹⁷ The survey was developed on the basis of recommendations from the WHO Patient Safety Solutions, the Joint Commission International, and the Institute for Safe Medication

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Practices.^{18–20} The survey consists of seven sections including 44 questions. Hospital characteristics were collected at the beginning of the interview. We asked in the first section of the survey about the presence of a medication safety committee, a medication safety practitioner and an error-reporting system. The second section focused on look-alike sound-alike (LASA) medications. Hospitals were also asked if they update their list of LASA medications and if they educate healthcare providers about these medications. The third section contained three questions concerning the hospital's policy on dealing with concentrated electrolyte solutions. The fourth section had 10 questions on practices during transitions in care. Participating hospitals were asked whether they have written policies regarding listing and updating medication lists, providing patients with lists of discharge medications, and educating healthcare providers about medication reconciliation during healthcare transitions. The fifth section reviewed the use of health information technology. The interviewer asked if pharmacists have electronic access to laboratory values and if a medication bar-coding system is used. The interviewer also asked whether the hospital uses an electronic medication administration record and if patient allergy information is a required field. The sixth section asked about the availability of drug information resources, and the seventh section asked about the implementation of other practices such as the use of maximum doses for high-alert medications, implementation of a controlled drug formulary system, the presence of an error-prone abbreviations list, and the use of a unit dose system.

Data collection

A pilot study was conducted in two hospitals to test the survey for local acceptability. Finally, supervisors of participating hospitals were asked to give consent to participate in the study; thereafter they were interviewed. Each interview took about half an hour.

Ethics considerations

The study was approved by the Khartoum State MOH.

Data analysis

Descriptive statistics were performed to illustrate the results of the survey. Results are displayed as counts and percentages. SPSS for Windows V22 was used for analysis.

RESULTS

Forty-one hospitals were surveyed; 19 (46%) were MOH hospitals, 7 (17%) were government non-MOH hospitals, and 15 (37%) were private hospitals (table 1). Most of the hospitals had a capacity of fewer than 100 beds. 5% of the hospitals had a medication safety committee and none had a medication safety officer (table 2). More than 97% of the hospitals did not have a list of LASA medications or a mechanism to review LASA medications and none of them labelled medications or included brand and generic names on the labels of medications. Concentrated electrolytes (potassium chloride, potassium phosphate, magnesium sulfate and parenteral sodium chloride solutions of concentration >0.9%) were available in the floor stock in 24 (67%) hospitals. High-risk warning labels were used on diluted electrolyte solutions in only 29% of the hospitals. More than 70% of the hospitals did not double-check final concentrations of prepared electrolyte solutions including calculations. None of the hospitals involved pharmacists in ascertaining patients' medication histories, and 35 (88%) hospitals provided patients with a list of medications at discharge. Only 6 (15%) of

Table 1 General characteristics of surveyed hospitals

Factor	Hospitals, n (%) [*]
Region	
First block (Khartoum)	17 (41)
Second block (Bahri)	13 (32)
Third block (Omdurman)	11 (27)
Type	
Ministry of Health	19 (46)
Government non-Ministry of Health	7 (17)
Private	15 (37)
Number of beds	
>100	23 (56)
100–299	11 (27)
300–499	3 (7)
≥500	4 (10)

^{*}Total number of hospitals 41.

the hospitals had a list for high-alert medications, and 2 (5%) had a list of error-prone abbreviations. A unit dose system was implemented in 20 (51%) hospitals, and computerised drug information resources were not available in any pharmacies of the hospitals. Only 10 (24%) hospitals used a computer system in the pharmacy to enter prescriptions, but none of these hospitals required patient allergy information before entering a drug order. Other more advanced practices were also not implemented, such as pharmacist electronic access to inpatient laboratory data and electronic medication administration records.

DISCUSSION

We assessed the presence of basic medication safety practices in Khartoum State hospitals and found that many basic practices were not implemented. Most importantly, only 15% of hospitals had a list with the maximum dose for high-alert medications, only 2% carried a list of LASA medications, and 5% had a list of error-prone abbreviations. Implementation of these practices would have no cost and could be a simple initiative from the hospital staff. Concentrated electrolytes were present in the floor stock in 67% of hospitals. Furthermore, 5% of the hospitals had a medication safety committee, and none had a medication safety officer. None of the surveyed hospitals involved pharmacists in obtaining medication histories. Earlier studies found that inconsistencies in medication histories occur in up to 60% of admitted patients.^{21–28} Pharmacists could decrease these errors by obtaining a medication history at the time of admission and discharge.^{29–30}

In a similar study in Saudi Arabia,¹⁷ the main results show that only 30% of the hospitals had a medication safety committee, and 9% of hospitals had a medication safety officer. Furthermore, no hospital involved pharmacists in obtaining medication histories.

Hospital accreditation requires implementation of many practices that improve the safety of medication practices in hospitals. However, to date the highest hospital authorities such as the MOH in Sudan do not require hospitals to obtain national or international accreditation. We suggest that this study will shed light on current medication safety practices in Sudan. We hope that the results will act as a corner stone for further studies, looking at reasons for not implementing medication safety practices in hospitals and interventions to change current practice in Sudan.

Table 2 Medication safety practices in Khartoum State hospitals

Factor	Hospitals, n (%) [*]
Medication safety committee and error-reporting systems	
Medication safety committee	2 (5)
Medication safety director	0
Paper-based error-reporting system used	6 (15)
Electronic error-reporting system implemented	0
Look-alike sound-alike (LASA) medications	
List of LASA medications	1 (2)
Mechanism for reviewing LASA medications	1 (2)
Mechanism to prevent LASA medications	14 (34)
Education on LASA medications	14 (34)
Medications stored in pharmacy alphabetically	1 (2)
Diagnosis field exists in the prescription or drug order	26 (63)
Labelling of medications	0
Both brand and generic names included on medication labels	0
Control of concentrated electrolyte solutions	
Concentrated electrolytes found in floor stock	24 (67)
Second person verifies final concentration of parenteral electrolyte solutions including calculations	7 (26)
High-risk warning label used on diluted electrolyte solutions	9 (29)
Transitions in care	
New order required in admission or transfer; order 'resume the same medications' not accepted	38 (93)
Procedure to update medication list exists	33 (89)
Complete drug history taken	40 (98)
Pharmacist takes medication history	0
Current medications list put in consistent highly visible location	38 (97)
Written policies and procedures to list and update the medication list	11 (30)
Current medication list updated with new physician orders	27 (82)
List of discharge medications	35 (88)
Healthcare professionals educated on procedures for reconciling medications	16 (39)
Information technology	
Electronic access to inpatient laboratory values	0
Medication bar coding	5 (12)
Electronic medication administration record	0
Pharmacy uses computer to enter prescription	10 (24)
Patient allergy history is required to enter an order	0
Drug allergy verified	0
Pharmacy computer screens drugs for drug allergy	0
Allergy list is clearly visible on all pages of medication administration records	0
Computer is directly interfaced with the laboratory	0
Body weight is a required field	0
Drug information	
Drug information resources in all patient care areas	1 (2)
Computerised drug information resources in the pharmacy	0
Other medication safety practices	
Renal or hepatic dosage adjustment for relevant patients	37 (90)
Maximum dose for high-alert drug	6 (15)
Controlled drug formulary system	3 (7)
A list of error-prone abbreviations is available	2 (5)
Unit dose system implemented	20 (51)
Medications brought from home by patient are not used	38 (97)
Discontinued medications are removed from patient supplies in a timely manner	24 (60)
Pharmacy staff receive baseline competency evaluation	36 (88)

^{*}Total number of hospitals 41.

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CONCLUSION

Most of the hospitals in Khartoum State do not implement basic medication safety practices. In Sudan, efforts must be made by the MOH to enforce laws and regulations that make implementation of medication safety practices mandatory in order to protect patient safety. The study findings support establishment of a national accreditation board, a national and hospital-based medication-error reporting system, faculty-based centres for medication safety in pharmacy faculties, and a new position for pharmacists as medication safety officers in hospitals.

Study limitations

The responses of the senior pharmacists or pharmacy supervisors to the survey were not verified. Such verification of the presence of these practices would require inspection of the pharmacy, which was not welcomed by many hospitals. Another limitation was that the survey asked general questions regarding the presence of certain practices and we did not ascertain the details about each practice.

Key messages

- Throughout the world, health systems have become increasingly concerned about the need to improve the quality of care provided to service users, including the safety, effectiveness, appropriateness, access, efficiency and acceptability of that care.
- In the past decade, research has shown that many interventions could decrease the frequency of medication errors. Many of these interventions include the use of information technology and automation, while others use other approaches such as involving a pharmacist with the medical team or the application of core practices aimed at preventing adverse drug events.
- The study gives baseline data for future studies in Khartoum State, Sudan.
- The study highlights the area of medication safety in hospitals in Sudan that requires further research.

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Competing interests None declared.

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REFERENCES

- Pearson P, Steven A, Howe A, *et al.* Learning about patient safety: organizational context and culture in the education of health care professionals. *J Health Serv Res Policy* 2010;15(Suppl 1):4–10.
- Runciman W, Hibbert P, Thomson R, *et al.* Towards an international classification for patient safety: key concepts and terms. *Int J Qual Health Care* 2009;21:18–26.
- Kohn LT, Corrigan JM, Donaldson MS, eds. *To err is human: building a safer health system*. National Academy Press, 2000. http://www.nap.edu/openbook.php?record_id=9728

- 4 Lewis PJ, Dornan T, Taylor D, *et al.* Prevalence, incidence and nature of prescribing errors in hospital inpatients: a systematic review. *Drug Saf* 2009;32:379–89.
- 5 Aspden P, Wolcott J, Bootman JL, *et al.* *Preventing medication errors: quality chasm series*. National Academies Press, 2006. http://www.nap.edu/catalog.php?record_id=11623
- 6 Al-Jeraisy MI, Alanazi MQ, Abolfotouh MA. Medication prescribing errors in a pediatric inpatient tertiary care setting in Saudi Arabia. *BMC Res Notes* 2011;4:294.
- 7 Al-Dhawailie AA. Inpatient prescribing errors and pharmacist intervention at a teaching hospital in Saudi Arabia. *Saudi Pharm J* 2011;19:193–6.
- 8 Yousif MA, Nizar S, Elmustafa MO, *et al.* Investigation of medication prescribing errors in Wad Medani, Gezira, Sudan. *Int J Risk Saf Med* 2011;23:11–16.
- 9 Bates DW, Cullen DJ, Laird N, *et al.* Incidence of adverse drug events and potential adverse drug events. Implications for prevention. ADE Prevention Study Group. *JAMA* 1995;274:29–34.
- 10 Morimoto T, Sakuma M, Matsui K, *et al.* Incidence of adverse drug events and medication errors in Japan: the JADE study. *J Gen Intern Med* 2011;26:148–53.
- 11 Aljadhey H, Mahmoud MA, Mayet A, *et al.* Incidence of adverse drug events in an academic hospital: a prospective cohort study. *Int J Qual Heal care* 2013;6:1–8.
- 12 Sakuma M, Ida H, Nakamura T, *et al.* Adverse drug events and medication errors in Japanese paediatric inpatients: a retrospective cohort study. *BMJ Qual Saf* 2014;23:830–7.
- 13 McClead RE, Catt C, Davis JT, *et al.* An internal quality improvement collaborative significantly reduces hospital-wide medication error related adverse drug events. *J Pediatr* 2014;165:1222–9.e1.
- 14 Gyllenstein H, Hakkarainen KM, Hägg S, *et al.* Economic impact of adverse drug events: a retrospective population-based cohort study of 4970 adults. *PLoS ONE* 2014;9:e92061.
- 15 Aljadhey H, Mahmoud MA, Murray MD, *et al.* A prospective multicenter study of the incidence of Adverse Drug Events in Saudi Arabia: The (ADESA) Study. *Pharmacoepidemiol Drug Saf* 2014;23:47–8.
- 16 Sudan Central Bureau of Statistics. *Census 2008 results—Khartoum State*. Sudan Central Bureau of Statistics, 2014. <http://www.cbs.gov.sd/en/files.php?id=7#&panel1-4>
- 17 Aljadhey H, Alhusan A, Alburikan K, *et al.* Medication safety practices in hospitals: a national survey in Saudi Arabia. *Saudi Pharm J* 2013;21:159–64.
- 18 World Health Organization (WHO). *The nine patient safety solutions, 2007*. World Health Organization, 2011. http://www.who.int/patientsafety/events/07/02_05_2007/en/
- 19 JCI. Joint Commission International. 2011. <http://www.jointcommissioninternational.org/>
- 20 ISMP. Institute for Safe Medication Practice. 2011. <http://www.ismp.org/selfassessments/default.asp>
- 21 Vira T, Colquhoun M, Etchells E. Reconcilable differences: correcting medication errors at hospital admission and discharge. *Qual Saf Health Care* 2006;15:122–6.
- 22 Gleason KM, Groszek JM, Sullivan C, *et al.* Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients. *Am J Health Syst Pharm* 2004;61:1689–95.
- 23 Cavin A, Sen B. Improving medication history recording and the identification of drug-related problems in an A&E department. *Hosp Pharm* 2005;12:109–12.
- 24 Bond CA, Raehl CL, Franke T. Clinical pharmacy services and hospital mortality rates. *Pharmacotherapy* 1999;19:556–64.
- 25 Bond CA, Raehl CL, Franke T. Clinical pharmacy services, pharmacy staffing, and the total cost of care in United States hospitals. *Pharmacotherapy* 2000;20:609–21.
- 26 Bond CA, Raehl CL, Franke T. Clinical pharmacy services, hospital pharmacy staffing, and medication errors in United States hospitals. *Pharmacotherapy* 2002;22:134–47.
- 27 McFadzean E, Isles C, Moffat J, *et al.* Is there a role of a prescribing pharmacist in preventing prescribing errors in a medical admissions unit? *Pharm J* 2003;270:896–9.
- 28 Tam VC, Knowles SR, Cornish PL, *et al.* Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. *CMAJ* 2005;173:510–15.
- 29 Strunk L, Matson A, Steinke D. Impact of a pharmacist on medication reconciliation on patient admission to a veterans affairs medical center. *Hosp Pharm* 2008;43:643–9.
- 30 Abuyassin BH, Aljadhey H, Al-Sultan M, *et al.* Accuracy of the medication history at admission to hospital in Saudi Arabia. *Saudi Pharm J King Saud University* 2011;19:263–7.